COURSE: Low-Noise Design for Spaceflight Hardware

PRESENTER: Mr. David Nelson, P.E. INCE Bd.Cert.
Nelson Acoustics

TARGET AUDIENCE: Engineers and scientists and others who are involved in design and development of experiment payloads for ISS and other manned space flight applications. The course is specifically aimed at payload developer teams, including NASA project office managers, design engineers, and contractor teams. The instructor for the course is David Nelson, who has taught several courses of this type for GRC in the past and has consulted extensively for payload developers at GRC and elsewhere.

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This course will provide an introduction to acoustics, relevant noise criteria, principles of low-noise design and noise emission testing, along with case studies and consultations on current projects. The target audience consists of engineers and scientists and others who are involved in design and development of experiment payloads for ISS and other manned space flight applications. The course is specifically aimed at payload developer teams, including NASA project office managers, design engineers, and contractor teams.

The first day will consist of classroom lecture (see agenda below). The morning of the second day will feature case study presentations on successful low-noise payload designs as well as a tutorial on acoustic emissions testing, including how we work with payload developer teams to perform acoustical testing here at GRC in our Acoustical Testing Laboratory (ATL). On the afternoon of the second day, the course will reconvene at the ATL for demonstrations and discussion of ATL's services for payload developers. Project teams will be able to meet with ATL staff to discuss possible acoustical testing plans and other issues (like hardware mounting and testing of individual component sound sources during the development phase of the project). On the third day, the instructor and guest lecturers will address hardware design issues and questions that attendees have brought to the course. After a brief introduction to the project by a spokesperson from each team, the instructor will facilitate a group discussion of the payload design and its acoustical issues, regardless of the developmental stage of the payload.

Payload developer teams are encouraged to sign up for this class together and to begin to identify their project's acoustical issues that they wish to have addressed by the instructor as part of the course.

COURSE AGENDA

Day 1 AM:
Fundamentals of Acoustics
Criteria: NC Curves, SSP 57000 and related spaceflight criteria

Day 1 PM:
Low-Noise Design (Concepts, Noise Emission Estimation Methods, Budgeting)
Fan Noise
Path Noise Control
Acoustic Emissions Testing of Spaceflight Hardware

Day 2 AM:
NASA Glenn's Acoustical Testing Laboratory: Supporting Low-Noise Design for Space Flight Hardware (Guest Speaker)
Successful Payload Case Histories
Successful Flight Rack Case Histories (Guest Speaker)
Troubleshooting Case Histories (Guest Speaker)

Day 2 PM:
Visit ATL for demonstrations and discussion

Day 3 AM:
Noise Control Challenges panel discussion. Includes short project descriptions by attendees followed by class discussion and feedback from presenters, moderated by Nelson

Day 3 PM:
Noise Control Challenges panel discussion (continued)

COURSE MATERIALS

Each attendee will receive a binder reproducing and expanding upon information presented during the corresponding segment of the course.

About the instructor

David A. Nelson, P.E., INCE Bd. Cert., is an acoustical consultant with more than 20 years of experience in product design for sound quality, acoustical measurement and analysis, and acoustics and noise control instruction. His experience also includes noise and vibration control for buildings and manufacturing processes, acoustical test facility

design, and directing a nationally recognized, NVLAP-accredited acoustics laboratory. He also has extensive practical experience in industrial and machinery noise control.

Mr. Nelson is familiar with GRC facilities, research, operations, and personnel, having provided training, consulting, and product development services for the past 10 years. Mr. Nelson has extensive experience in low-noise design and sound quality work for the commercial products industry and is an expert on gas flow systems noise (including fan noise related to cooling systems) for computer and information technology equipment and large industrial applications.